

What is claimed is:

1. A method for providing a backup copy of data on a primary storage
comprising:

5 receiving a write request;
journaling said write request in one of a plurality of partial journals; and
updating said primary storage in accordance with said write request.

2. The method of Claim 1, further comprising:

10 receiving each of said plurality of partial journals having a plurality of partial
journal entries;
merging said plurality of partial journal entries in accordance with a
predetermined merging time period forming a merged partial journal entry for a particular
storage location, said merged partial journal entry reflecting application of data
15 modifications for said particular storage location for said predetermined merging time
period.

3. The method of Claim 2, wherein a primary journal includes a first portion of
for received partial journal entries and a second portion for merged partial journal
20 entries.

4. The method of Claim 1, wherein each partial journal entry in said plurality of
partial journals includes a time stamp associated with a write request.

5. The method of Claim 1, further comprising:

periodically flushing said plurality of partial journals to a primary journal.

5 6. The method of Claim 5, wherein contents of each partial journal are included in a primary journal when said each partial journal is filled in accordance with a predetermined capacity level.

10 7. The method of Claim 6, wherein partial journal entries within said primary journal are ordered in accordance with a time stamp value associated with each of said partial journal entries, and each of said merged partial journal entries within said primary journal are ordered in accordance with a time stamp value associated with each of said merged journal entries.

15 8. The method of Claim 1, wherein each of said plurality of partial journals is associated with an input port in a switch and includes journal entries for all write requests received on said associated input port.

20 9. The method of Claim 8, wherein journaling of write requests received on an input port is performed by a processor associated with said input port and a partial log associated with said input port is stored on a portion of memory associated with said input port.

10. The method of Claim 1, wherein said write request is made with respect to a copy of data included on said primary storage.

5 11. The method of Claim 1, wherein said primary storage is one of: a physical device, a logical device, a virtual device, and a portion of one or more different devices.

12. The method of Claim 10, wherein each of said time stamp values is obtained using a phase lock loop processing technique and using actual time values periodically broadcast from a stable time base.

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13. The method of Claim 1, wherein each of said partial journal entries includes a time stamp value associated with a corresponding write request, wherein each time stamp value included in a first partial journal is synchronized with other time stamp values included in a second different partial journal.

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14. The method of Claim 13, wherein each of said time stamp values is obtained using a phase lock loop processing technique and using actual time values periodically broadcast from a stable time base.

20 15. The method of Claim 2, wherein each partial journal is associated with an input port and all write requests from that input port are journaled in the corresponding each partial journal and wherein each merged partial journal entry includes an indicator

indicating the validity of journal entries received from each input port in accordance with a time stamp value associated with said merged partial journal entry.

16. The method of Claim 1, wherein said journaling and said updating are issued
5 simultaneously.

17. The method of Claim 16, wherein each partial journal entry includes a status indicator reflecting a status of both said journaling and said updating.

18. A system that performs a continuous back up of data included in a primary storage unit, comprising:

5 a switch including input ports, each of said input ports being associated with a processor and a portion of memory;

a plurality of partial journals, each of said plurality of partial journals being associated with a unique one of said input ports and being stored in said portion of memory associated with said unique input port, said each partial journal including journal entries for write requests received on said unique input port; and

10 a primary journal incorporating portions of said plurality of partial journals associated with write requests that have occurred earlier in time than those entries currently included in said partial journals.

19. The system of Claim 18, further comprising:

15 a stable time base that broadcasts an actual time periodically to each of said processors included in said switch; and wherein associated with each of said processors is a phase lock loop component that maintains a time value synchronized with other time values maintained by other phase lock loop components, each of said journal entries in said partial journals including a time stamp value associated with a received write
20 request in accordance with a time of an associated phase lock loop component.

20. The system of Claim 18, wherein each partial journal entry included in a partial journal includes a data value of a location after applying a modification to data at said location associated with a write request corresponding to said each partial journal entry.

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21. The system of Claim 18, wherein each partial journal entry included in a partial journal includes a data value of a location prior to applying an update of a write request corresponding to said each partial journal entry.

22. A method for providing a backup copy of data on a primary storage
comprising:
- receiving a write request for a location in primary storage;
 - receiving a copy of data at said location on said primary storage;
 - 5 journaling said write request in one of a plurality of partial journals in a partial
journal entry including said copy prior to performing said write request; and
 - updating said primary storage in accordance with said write request.
23. The method of Claim 22, wherein partial journal entries in said partial
10 journals have an associated time stamp value, said partial journal entries being ordered in
accordance with associated time stamp values.
24. The method of Claim 23, wherein said partial journal entries are transferred
from said partial journals to a primary journal.
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25. The method of Claim 24, further comprising:
- merging a portion of said partial journal entries for a predetermined time period
for write requests to a storage location producing a merged partial journal entry for said
storage location.

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26. The method of Claim 25, wherein a backup copy of said primary storage with respect to a point in time equal to or less than a current time value is produced using said plurality of partial journals and said primary storage without maintaining a copy of said primary storage.

27. A method of creating a point-in-time copy of a primary storage comprising:
receiving journal entries corresponding to write requests formed using a plurality
5 of distributed partial journals, each partial journal being associated with a portion of write
requests, said journal entries being ordered in accordance with a time value associated
with each of said write requests, each of said journal entries including a value for a
corresponding portion of primary storage before performing a write request;
creating a map of pointers to said primary storage wherein each pointer is
10 associated with a particular location identifier; and
performing, for each of said journal entries including a location identifier and a
data value prior to performing a write request:
determining a corresponding map pointer for each location identifier
included in a journal entry; and
15 if said corresponding map pointer points to a value in the primary storage,
then adjusting the map pointer to point to said data value in said each journal
entry.

28. The method of Claim 27, wherein each of said partial journals includes
20 partial journal entries for write requests received on a particular input port to a switch,
said each partial journal being stored in a portion of memory associated with said input
port, wherein journaling of write requests to that input port is performed by a processor
associated with said input port.

29. A computer program product that provides a backup copy of data on a primary storage comprising code that:

receives a write request;

5 journals said write request in one of a plurality of partial journals; and
updates said primary storage in accordance with said write request.

30. The computer program product of Claim 29, further comprising code that:

receives each of said plurality of partial journals having a plurality of partial

10 journal entries; and

merges said plurality of partial journal entries in accordance with a predetermined merging time period forming a merged partial journal entry for a particular storage location, said merged partial journal entry reflecting application of data modifications for said particular storage location for said predetermined merging time period.

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31. The computer program product of Claim 30, wherein a primary journal includes a first portion of for received partial journal entries and a second portion for merged partial journal entries.

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32. The computer program product of Claim 29, wherein each partial journal entry in said plurality of partial journals includes a time stamp associated with a write request.

33. The computer program product of Claim 29, further comprising code that:
periodically flushes said plurality of partial journals to a primary journal.

34. The computer program product of Claim 33, wherein contents of each partial
5 journal are included in a primary journal when said each partial journal is filled in
accordance with a predetermined capacity level.

35. The computer program product of Claim 34, wherein partial journal entries
within said primary journal are ordered in accordance with a time stamp value associated
10 with each of said partial journal entries, and each of said merged partial journal entries
within said primary journal are ordered in accordance with a time stamp value associated
with each of said merged journal entries.

36. The computer program product of Claim 29, wherein each of said plurality of
15 partial journals is associated with an input port in a switch and includes journal entries for
all write requests received on said associated input port.

37. The computer program product of Claim 36, wherein journaling of write
requests received on an input port is performed by a processor associated with said input
20 port and a partial log associated with said input port is stored on a portion of memory
associated with said input port.

38. The computer program product of Claim 29, wherein said write request is made with respect to a copy of data included on said primary storage.

39. The computer program product of Claim 29, wherein said primary storage is one of: a physical device, a logical device, a virtual device, and a portion of one or more different devices.

40. The computer program product of Claim 38, wherein each of said time stamp values is obtained using a phase lock loop processing technique and using actual time values periodically broadcast from a stable time base.

41. The computer program product of Claim 29, wherein each of said partial journal entries includes a time stamp value associated with a corresponding write request, wherein each time stamp value included in a first partial journal is synchronized with other time stamp values included in a second different partial journal.

42. The computer program product of Claim 41, wherein each of said time stamp values is obtained using a phase lock loop processing technique and using actual time values periodically broadcast from a stable time base.

43. The computer program product of Claim 30, wherein each partial journal is associated with an input port and all write requests from that input port are journaled in the corresponding each partial journal and wherein each merged partial journal entry

includes an indicator indicating the validity of journal entries received from each input port in accordance with a time stamp value associated with said merged partial journal entry.

5 44. The computer program product of Claim 29, wherein said journaling and said updating are issued simultaneously.

 45. The computer program product of Claim 44, wherein each partial journal entry includes a status indicator reflecting a status of both said journaling and said
10 updating.

46. A computer program product that provides a backup copy of data on a primary storage comprising code that:

receives a write request for a location in primary storage;

receives a copy of data at said location on said primary storage;

5 journals said write request in one of a plurality of partial journals in a partial journal entry including said copy prior to performing said write request; and updates said primary storage in accordance with said write request.

47. The computer program product of Claim 46, wherein partial journal entries in
10 said partial journals have an associated time stamp value, said partial journal entries being ordered in accordance with associated time stamp values.

48. The computer program product of Claim 47, wherein said partial journal entries are transferred from said partial journals to a primary journal.

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49. The computer program product of Claim 48, further comprising code that:
merges a portion of said partial journal entries for a predetermined time period for write requests to a storage location producing a merged partial journal entry for said storage location.

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50. The computer program product of Claim 49, wherein a backup copy of said primary storage with respect to a point in time equal to or less than a current time value is produced using said plurality of partial journals and said primary storage without maintaining a copy of said primary storage.

51. A computer program product that creates a point-in-time copy of a primary storage comprising code that:

5 receives journal entries corresponding to write requests formed using a plurality of distributed partial journals, each partial journal being associated with a portion of write requests, said journal entries being ordered in accordance with a time value associated with each of said write requests, each of said journal entries including a value for a corresponding portion of primary storage before performing a write request;

10 creates a map of pointers to said primary storage wherein each pointer is associated with a particular location identifier; and

performs, for each of said journal entries including a location identifier and a data value prior to performing a write request:

determining a corresponding map pointer for each location identifier
15 included in a journal entry; and
if said corresponding map pointer points to a value in the primary storage, then adjusting the map pointer to point to said data value in said each journal entry.

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52. The computer program product of Claim 51, wherein each of said partial
journals includes partial journal entries for write requests received on a particular input
port to a switch, said each partial journal being stored in a portion of memory associated
with said input port, wherein journaling of write requests to that input port is performed
5 by a processor associated with said input port.